REMARKS/ARGUMENTS

Claims 1-2, 4-22 are currently pending. Claims 1, 2, 4, 9, 10, 21, and 22 are amended. Claim 4 is cancelled.

Claims 1-19 and 21-22 are rejected under 35 U.S.C. 102(a) as being anticipated by Brabec et al. (NPL: Practical Shadow Mapping), and claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brabec et al. in view of Corbeta (U.S. 6,903,741). Applicant submits that all of the claims currently pending are patentably distinguishable over the cited references, and reconsideration and allowance of this application are respectfully requested.

Independent **claim 1** includes, among other limitations, "generating a trapezoid to approximate an area, E, within the eye's frustum in a post-perspective space, L, of the light source," and "wherein generating the trapezoid comprises: computing a centre line passing from a position of the eye through E; calculating a 2D convex hull of E; and calculating a top line l_t and a base line l_b of the trapezoid using as constraints that l_t and l_b each are orthogonal to the centre line and each touch the 2D convex hull." Brabec does not teach the above limitations.

First, Brabec does not teach "generating a trapezoid to approximate an area, E, within the eye's frustum in a post-perspective space, L, of the light_source." That is, in the claimed invention, the generating of the trapezoid occurs in the post-perspective space of a light source. This, as is readily appreciated by a person skilled in the art and also explicitly mentioned in the specification as filed, for example on page 9, lines 18 to 24 of the corresponding PCT application as published, is a space representing the light source's "view" of the relevant scene.

However, the cited Figure 3 of Brabec does not show any processes / approximations being performed in the post-perspective space of the light source. Rather, Figure 3 is a "bird's eye" illustration of the camera's viewing frustum and the light source's viewing frustum in real space. For that reason alone, Applicant respectfully submits that Figure 3 of Brabec, which is relied upon to reject claim 1 does not teach the above limitation.

In contrast, the generation of the trapezoid in claim 1 occurs only after the eye's frustum has been transformed into the post-perspective space of the light source. With reference to

Figure 3 of the present specification, it is thus only in the <u>post-perspective space</u> of the light 300, into which the eye's frustum 302 has been transformed, that a trapezoid 306 is generated. In other words, Figure 3 of Brabec would first have to be transformed into the light's post-perspective space corresponding to space 300 in Figure 3 of the present specification, before the trapezoid generation would be performed.

In the illustration below, Applicant seeks to help the Examiner to appreciate that Figure 3 of Brabec is actually only a real space representation of the camera and light configuration, which itself must first be transformed into the light's post-perspective space 300, and the trapezoid generation as defined in claim 1 only takes place thereafter.
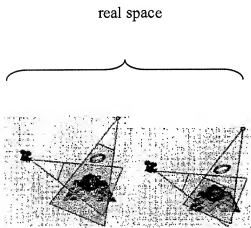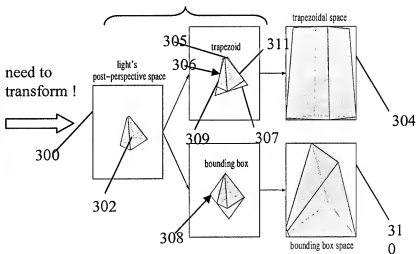
Figure 3 Brabec: Figure 3 present specification:

     real space   Trapezoid generation
                      in light's post perspective space

Second, Brabec does not teach "wherein generating the trapezoid comprises: computing a centre line passing from a position of the eye through E; calculating a 2D convex hull of E; and calculating a top line l_t and a base line l_b of the trapezoid using as constraints that l_t and l_b each are orthogonal to the centre line and each touch the 2D convex hull."

In rejecting previous claim 2, which included features similar to the above features of amended claim 1, the Examiner had referred to page 3, lines 27 to 28 of Brabec as allegedly disclosing the relevant center line. Applicant respectfully disagrees with that assessment. More particularly, the "depths value distribution" described in that part of Brabec is a depth (z) distribution from the view of the light source, and not from the eye as now positively recited in amended claim 1. This is clearly described on page 3 of Brabec, more particular starting from line 1:

> When rendering the scene from a given view point, depths values are sampled non-uniformally (1/z) due to the perspective projection. This makes sense for the camera position, since objects near to the viewer are more important than those far away, and therefore sample at a higher precision. For the light source position this assumption is no longer true. It could be the case that objects very far from the light source are the main focus of the actual camera, so sampling those at lower z precision may introduce artifacts, e.g. missing shadow detail.

Therefore, it is clear that the depth value distribution illustrated in Figure 2 on page 3 of Brabec concerns a distance (or z-axis) that originates from the light source, and not from the position of the eye, as positively recited in amended claim 1. This is also highlighted in lines 27 to 29 referred to by the Examiner, namely that the linear depth value corresponds to the eye space value mapped according to light source near and far plane, i.e. not according to the eye's near and far plane.

Again with reference to the rejection of previous claim 2, the Examiner also argued that Brabec on page 6 comprises calculating a 2-D convex hull of E. However, the Examiner then went on to argue that the step of calculating a top line that is orthogonal to the center line and touches the boundary of the convex hull of E was allegedly disclosed on page 4 of Brabec, i.e. at a stage of the processing described in Brabec where the 2-D convex hull had not yet even been calculated in the first place.

In the amended claim 1, it has been highlighted that the top line and base line of the trapezoid are calculated using as a constraint that they are each orthogonal to the center line and each touch the 2-D convex hull. Therefore, this feature is now clearly distinct from setting of the near and far planes described on page 4 in Brabec. There simply is no disclosure of setting the near and far plane, which the Examiner has equated to the top line and base line, with the constraints as defined in amended claim 1, and indeed that would be impossible since the 2-D convex hull has not even calculated at the time of setting the near and far plane in Brabec, as mentioned above.

In contrast, the only "constraints" disclosed for setting the near and far plane in Brabec is setting the near and far plane so that they include between them those objects that are visible in the final scene, and clamping depth values of objects outside the space between the near and far plane, as depicted on the right side of Figure 3. There is no disclosure or suggestion of at least a constraint of the near and far plane (without admitting that they may be equated to the top line and base line) fulfilling a constraint of touching any type of 2-D convex hull. Rather, the 2-D convex hull in Brabec is only later used starting from page 6, as mentioned above.

As a result, claim 1 is not anticipated by Brabec and therefore is patentable over the cited references.

Independent claims 21 and 22 include similar limitation, therefore, they are also patentable over the cited references.

In short, dependent claims 2, 4-20 are dependent from allowable independent claim 1, and therefore include all the limitations of the allowable claim 1 and additional limitations therein. Accordingly, these claims are also allowable over the cited references, as being dependent from the allowable independent claim 1, and for the additional limitations they include therein.

In view of the foregoing amendments and remarks, it is respectfully submitted that this application is now in condition for allowance, and accordingly, reconsideration and allowance are respectfully requested.

Respectfully submitted,

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